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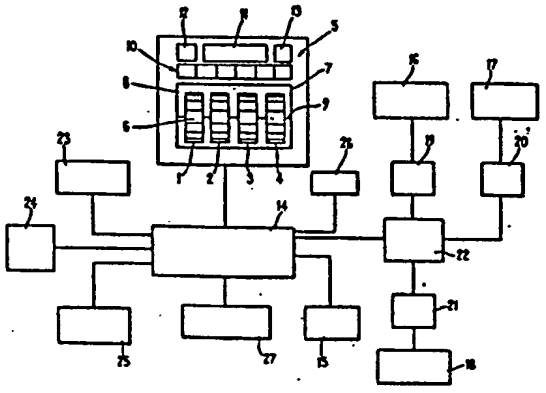
(71) Applicant: **ACE COIN EQUIPMENT LIMITED, Ace House Lanely Road Talbot Green, Mid. Glamorgan South Wales (GB)**

(72) Inventor: **Arnold, William Keith, 21 Ddol Road, Dunvant Swansea (GB)**
Inventor: **Earle, Michael Francis Henry, 8 Windsor Street, Uplands Swansea (GB)**
Inventor: **Cox, Richard Thomas, 5 Railway Terrace, Pontyclun Mid. Glamorgan (GB)**
Inventor: **Lloyd, David Roderick, 26 Tudor Way Crown Hill, Newton Llantwit Nr. Pontypridd (GB)**

(74) Representative: **Meddle, Alan Leonard, FORRESTER & BOEHMERT Widenmayerstrasse 4/I, D-8000 Munchen 22 (DE)**

(54) Video gaming or amusement machine.

(57) A video fruit machine has a display screen 5 constituted by the screen of a cathode ray tube. Electronic circuitry of the machine operates to provide video signals to the cathode ray tube to produce on the screen an image of four columns 1 to 4 of symbols, each column having a plurality of symbol positions 6 and representing the visible periphery of a fruit machine reel rotatable about an axis parallel to the screen. During a game the electronic circuitry of the machine changes the displayed image in such a way that the symbols of a column travel up or down the column to disappear at the top or bottom of the column and be replaced by new symbols added to the bottom or top of the column, thereby simulating the rotation of reels in a mechanical fruit machine employing rotatable reels. At the end of a game, the movement of the symbol is stopped and the combination of symbols in the resulting final static image normally determines whether or not a player has won. Various measures are taken to simulate accurately the appearance and performance of mechanical reels. However, the parameters of the simulated reels, particularly the apparently visible reel periphery, are made variable by electronic means.



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"Video gaming or amusement machine"

THIS INVENTION relates to improvements in or relating to video gaming or amusement with prizes machines.

In particular, the invention concerns such machines which have a display screen on which is formed an image of a symbol array in which the symbols change at random during a game, the combination of symbols in a static condition of the array (usually at the end of the game) determining whether or not the player has won a prize according to the predetermined rules of the game.

The present invention finds particular application in the case of a so-called video fruit machine in which the image formed on the display screen (for example, the screen of a cathode ray tube) consists of a plurality of columns of symbols in side-by-side relationship, each column having the same number of symbols and representing the visible periphery of a reel rotatable about an axis parallel to the display screen. During a game, the symbols progress down the column and disappear from the bottom of the column, while simultaneously fresh symbols appear at the top of the column. At the end of the game, the movement of the symbols is stopped and the combination of symbols appearing in the resulting static final image determines whether a player has won.

In accordance with a first aspect of the invention, there is provided a video fruit machine having a display screen on which is formed an image of a column of symbols, the symbols progressing during play along the column to disappear from one end thereof while fresh symbols appear at the other end of the column, the symbols appearing at the said other end in a predetermined sequence, in which machine the number of symbols in the sequence of symbols is variable to alter the effective sequence length while maintaining the same length for the column of symbols. In a machine having

a plurality of symbol columns, symbol sequences corresponding to the different columns may comprise different numbers of symbols.

According to a second aspect of the invention, there is provided a video fruit machine having a display screen on which is formed an image consisting of a plurality of columns of symbols, the symbols progressing during play along the column to disappear from one end thereof while fresh symbols appear at the other end of the column, in which machine the symbols in each column are movable in either direction along the column independently of the direction of movement of symbols in any other column, whereby to simulate independent rotational movement of a mechanical reel in either direction. Desirably, the speed of movement of the symbols in each column may be varied independently of the speed of movement of the symbols in any other column. Desirably, the symbols in a column may be moved longitudinally in either direction intermittently by one symbol position to provide a so-called nudge feature, each intermittent movement being accompanied by oscillation of the symbols within decreasing limits relative to a fixed datum line extending transversely of the column so as to simulate mechanical bounce.

In a third aspect, the invention provides a video fruit machine having a display screen in which is formed an image consisting of a plurality of columns of symbols, the symbols progressing during play along the column to disappear from one end thereof while fresh symbols appear at the other end of the column , in which machine the columns are arranged in at least one group comprising a variable number of columns. Preferably, the or each group of symbol columns may be displayed in any position in the display screen.

According to a fourth aspect of the invention, there is provided a video fruit machine having a display screen on which is formed an image of a column of symbols, the symbols progressing during play along the column to disappear from one end thereof while fresh symbols appear at the other end, in which machine the column may be moved linearly, i.e. translated, in part or in whole to any position on the screen. During this translation of the column, the symbols may also be in movement along the column.

According to a fifth aspect, the invention provides a video gaming or amusement with prizes machine having a display screen on which is formed an image of a symbol array in which the symbols change at random during a game, the combination of symbols in a static condition of the array determining wheteher or not the player has won a prize to the rules of the game, in which machine means are provided for self-testing the operation of the machine. In an embodiment of the invention means are provided to test and adjust the picture quality of the display screen, to simulate game play including the setting up of a winning combination, and to test input and output functions of the machine.

In accordance with a sixth aspect of the invention, there is provided a video gaming or amusement with prizes machine having a display screen in which is formed an image of a symbol array in which the symbols change at random during a game, the combination of symbols in a static condition of the array determining whether or not the player has won a prize according to rules of the game, in which machine the colour and shape of the individual symbols can be varied by selection means.

According to a seventh aspect, the invention provides a video fruit machine having a display screen on which is formed in image of a column of symbols, the symbols progressing during play along the column to disappear from one end thereof while fresh symbols appear at the other end, in which machine means are provided for translating the column of symbols transversely during play across a viewing area of the screen, whereby the column disappears from one edge of the viewing area to re-appear at the opposite edge of the viewing area.

In order that the invention may be readily understood an embodiment thereof will now be described, by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is a schematic block diagram of a video fruit machine embodying the invention;

FIGURE 2 illustrates schematically the manner of simulating the curvature of a mechanical reel;

FIGURE 3 illustrates schematically the processing of picture information to achieve simulation in accordance with Figure 2;

FIGURE 4 is a graph illustrating the simulation of the mechanical bounce of a reel;

FIGURE 5 is a graph illustrating the simulation of the acceleration of a mechanical reel; and

FIGURE 6 is a graph illustrating the nudge action of the machine.

The accompanying drawings diagrammatically illustrate, by way of example, a video fruit machine having a display screen 5 constituted by the screen of a cathode ray tube. Electronic circuitry of the machine operates to provide video signals to the cathode ray tube to produce on the screen an image of four columns 1 to 4 of symbols, each column having a plurality of symbol positions 6 and representing the visible periphery of a fruit machine reel rotatable about an axis parallel to the screen. During a game the electronic circuitry of the machine changes the displayed image in such a way that the symbols of a column travel up or down the column to disappear at the top or bottom of the column and be replaced by new symbols added to the bottom or top of the column, thereby simulating the rotation of reels in a mechanical fruit machine employing rotatable reels. At the end of a game, the movement of the symbol is stopped and the combination of symbols in the resulting final static image normally determines whether or not a player has won.

However, on selected games, the player is given an opportunity to vary the final image in an attempt to achieve a winning combination of symbols. Further, means are also provided for allowing the player, at the start of selected games, to maintain the image of any selected symbol column static during the game by pressing a so-called "hold" button.

The electronic circuitry also provides video signals to produce on the screen images of playing instructions and other information including facia markings, such as lines 7 delineating the playing area 8, payline 9, prize indication area 10, instruction area 11, maufacturer's logo area 12 and number of plays or credit area 13.

The electronic includes a central processing unit 14 operating in accordance with a program stored in an electronic program store 15. The video picture information for the displayed image on the screen 5 is provided by a reel picture store 16, an information store 17 and a feature picture store 18 via respective control and select circuits 19, 20 and 21 a video signal combining circuit 22. The unit 14 receives information from and/or controls a coin mechanism 23, a meter storage unit 24, a payout mechanism 25, a sound generator 26 and a percentage compensator 27.

Various measures are taken to simulate accurately the appearance and performance of mechanical reels in a conventional fruit machine and there will now be described with reference to Figures 2 and 6. It is noted that the motion of the symbols along a symbol column takes place in a series of small discrete steps giving the illusion of continuous motion.

Referring to Figures 2 and 3, the visual appearance of a curved mechanical reel is simulated in each column 1 to 4 of symbols by altering the height of the symbol in dependence upon its distance from the payline 9 at the longitudinal centre of the symbol column, whilst keeping the width of the symbol constant. In the present embodiment, this effect is achieved using a variable clock frequency divider circuit 30 which receives a high speed stable clock signal at 31 and counts a variable number of the hight speed clock cycles to generate a lower frequency output signal or derived clock signal. This derived clock signal is then used to control reading out of the individual picture-elements from the reel picture store 16. It will be appreciated that by altering the rate at which picture elements are read out from the reel picture store, the apparent height of the symbol can be changed. The divider circuit 30 is controlled by altering the number of high speed clock cycles counted by signals on frequency control lines 32.

It is envisaged that the variation in symbol height could be achieved in other ways. For example, picture information corresponding to a number of different heights for the same symbol would be stored for reading out at the same rate, the appropriate information being read out in dependence upon the position of the symbol in the symbol column.

When a mechanical reel of a conventional fruit machine is stopped at the end of a game, it does not stop instantaneously, but instead oscillates or bounces for a while before finally coming to rest.

The present machine simulates this mechanical bounce by controlling the reel picture information from store 16 so that the symbols oscillate relative to the pay line 9 within decreasing limits. The motion of a fixed point on the symbol column is essentially a damped vibration as illustrated in Figure 4. In fact, each upward or downward movement of a symbol during this simulated bounce is performed in multiple discrete steps creating the illusion of smooth motion. Stopping of the reel may be accompanied by an optional mechanical or electronic noise provided by sound generator 26 and simulating the noise produced by a mechanical reel on stopping or possibly some other desired noise. The noise generator 27 may be switched into or out of circuit depending upon whether sound effects are required.

When a mechanical reel of a conventional fruit machine is set in motion at the beginning of a game it does not instantaneously assume its full running speed. In the present video machine the acceleration characteristics of a mechanical reel are simulated by progressively decreasing the time period between successive discrete movements of the symbols to a minimum corresponding to the full speed condition as shown in Figure 5. This is achieved by correspondingly varying the rate at which information corresponding to successive images of a symbol is read out of the reel picture store 16. It is envisaged that a similar effect could be achieved by increasing the size of the discrete movements whilst maintaining a constant time interval between readouts of reel picture information.

In addition to close simulation of the appearance and performance of mechanical reels, it is also possible to achieve effects with the symbol columns of the present video apparatus which are not possible with conventional mechanical reel units. For example, the symbols in any symbol column may be made to move along the reel in either direction independently of and simultaneously with the movement of symbols in the other columns. The number of symbols in the sequence of symbols for a symbol column may be varied for each reel and independently of the other reels. Similarly, the symbol at any particular position in the symbol sequence of a

column may be varied. Multiple reels may be displayed in different groupings and positions in the display screen, giving possibilities for additional feature games and radically different game concepts. Each reel may have a multiple alternative sequence of symbols providing different symbol combinations and/or numbers of symbols these alternatives may be selected by the operation of corresponding option switches or by the percentage compensator 27 to alter the payout percentage of the machine.

The displayed symbols allow the player to view a section of the symbol sequence of a symbol column. The number of symbols which are displayed can be varied in each reel independently at any time. This includes the case when the game may require none of the symbols to be seen at certain times, such as when a symbol is "wild" and is equivalent to any symbol.

Any symbol column or columns may be moved in translation wholly or in part to any position on the screen at any time. This translation may take place simultaneously with movement of the symbols along the column, enabling a game in which simultaneously with the longitudinal symbol movement the reels progress across the screen to disappear in turn at one edge of the screen and re-appear at the other. This also enables a game feature whereby the player may exchange the positions of two or more reels at the end of a game on an attempt to achieve a winning combination of symbols.

Any displayed symbol may be flashed against the background to draw the attention of the player to a certain occurrence, such as a winning combination.

The colour of symbols and other shapes may be changed during the course of a game or at other times.

The logos of the manufacturer of the machine is displayed on the screen in the designated area 12 using information from the store 17 at the appropriate time. Similarly, permanent or temporary playing instructions or information may be displayed on the display screen using information from store 17.

The central processing unit 14 monitors the operation of the machine and particularly the coin mechanism 23 and the payout mechanism 25 and feeds information to the meter store 24 which thus stores the current status of the machine and a record of past events. For example, the meter store may reward the total number of plays, the cash inserted into the machine, the number of high denomination coins (e.g. 50p) inserted, the number of tokens inserted, the number of coins (e.g. 10p) paid out, the number of tokens paid out and the state of filling of a prize stock. This information may be read out and displayed on the display screen in whole or in part in a number of specific operating modes of the machine. For example, the machine may have: a refill mode in which the current value of the prize stock meter is displayed and incremented as coins are inserted; a meter read mode in which the normal display on the screen is replaced by the current readings of the various meters and noise of the meter contents can be altered; and a meter clear mode in which the meter values are displayed and can be cleared individually.

The percentage payout of the machine can be set by selection switches giving four different percentage payouts. The selected percentage payout is maintained by the percentage compensator 27 as follows. A counter of the compressor has a predetermined range divided into three ranges, namely a low range, a medium range and a high range. Each time a game is played the number 100 is added to the counter and each time a given unit of value (e.g. 10p) is paid out, a number dependent on the set percentage payout is deducted from the counter. The range in which the count of the counter lies at the start of a game will determine the range of hold percentage/feature game occurrence for that game, either allowing none or less holds and features to provide stabilisation of the percentage payout in the long term. The low range (00000-09999) of the counter corresponds to a low percentage of holds and features, the medium counter range (10000-12999) to a medium percentage of holds and features and the high counter range (13000 to 23000) to a high percentage of holds and features. A counter reset facility is provided to load the number 10100 into the counter, thereby setting it at medium hold and feature percentages. The counter is prevented from over-running the ends of the counting range and the state of the counter is readable in a test mode.

The machine of the present invention may be provided with means for self-testing the functioning of the machine. In the test mode of the machine, routines exist for testing the operation of the cathode ray tube by generating and supplying to the tube a video signal corresponding to a multi-coloured cross hatch test pattern. The operation of the win detection and payout mechanism may be tested by the setting up of a winning line and the occurrence of features by simulated game play. The test routine is entered on activation of the test switch, different test modes being obtained using various of the player controls of the machine. Deactivation of the test switch returns the machine to normal play at any time, the percentage compensator being reset automatically to medium and the symbol columns being set to a non-winning combination.

It is noted that the determination of a winning combination in the present machine is made by the processor unit. Accordingly, it is not necessary for the display section of the electronic circuitry or the cathode ray tube to function correctly to ensure correct payments. A malfunction elsewhere during a game will not therefore prevent the processor unit determining a win and causing the corresponding payout to be made.

CLAIMS:

1. A video fruit machine having a display screen on which is formed an image of a column of symbols, the symbols progressing during play along the column to disappear from one end thereof while fresh symbols appear at the other end of the column, the symbols appearing at the said other end in a predetermined sequence, in which machine the number of symbols in the sequence of symbols is variable to alter the effective sequence length while maintaining the same length for the column of symbols.

2. A video fruit machine having a display screen on which is formed an image consisting of a plurality of columns of symbols, the symbols progressing during play along the column to disappear from one end thereof while fresh symbols appear at the other end of the column, in which machine the symbols in each column are movable in either direction along the column independently of the direction of movement of symbols in any other column, whereby to simulate independent rotational movement of a mechanical reel in either direction.

3. A video fruit machine having a display screen in which is formed an image consisting of a plurality of columns of symbols, the symbols progressing during play along the column to disappear from one end thereof while fresh symbols appear at the other end of the column , in which machine the columns are arranged in at least one group comprising a variable number of columns.

4. A video fruit machine having a display screen on which is formed an image of a column of symbols, the symbols progressing during play along the column to disappear from one end thereof while fresh symbols appear at the other end, in which machine the column may be moved linearly, i.e. translated, in part or in whole to any position on the screen.

5. A video gaming or amusement with prizes machine having a display screen on which is formed an image of a symbol array in which the symbols change at random during a game, the combination of symbols in a static condition of the array determining whetеher or not the player has won a prize to the rules of the game, in which machine means are provided for self-testing the operation of the machine.

6. A video gaming or amusement with prizes machine having a display screen in which is formed an image of a symbol array in which the symbols change at random during a game, the combination of symbols in a static condition of the array determining whether or not the player has won a prize according to rules of the game, in which machine the colour and shape of the individual symbols can be varied by selection means.

7. A video fruit machine having a display screen on which is formed in image of a column of symbols, the symbols progressing during play along the column to disappear from one end thereof while fresh symbols appear at the other end, in which machine means are provided for translating the column of symbols transversely during play across a viewing area of the screen, whereby the column disappears from one edge of the viewing area to re-appear at the opposite edge of the viewing area.

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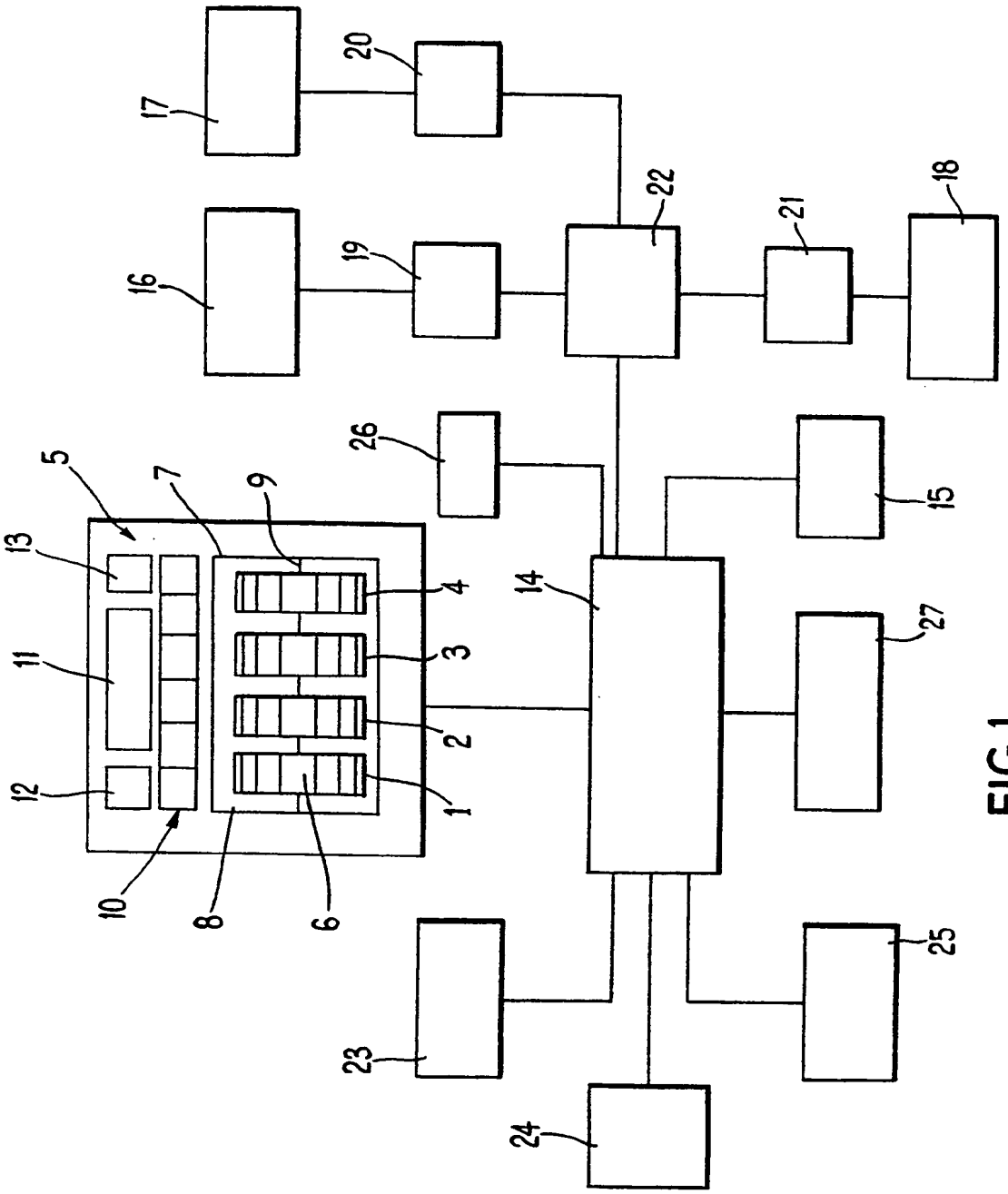

FIG.1

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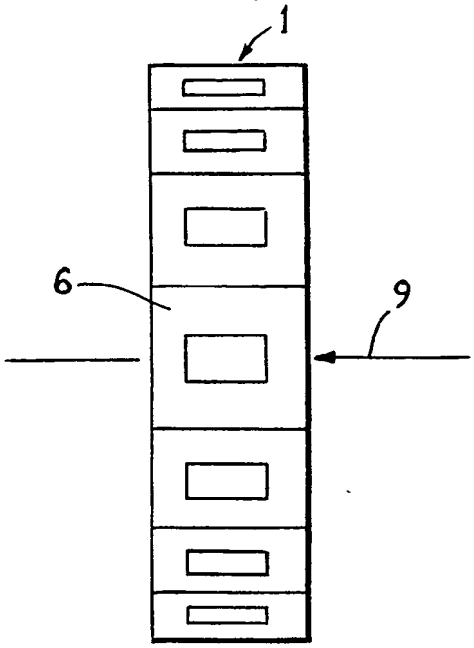

FIG. 2

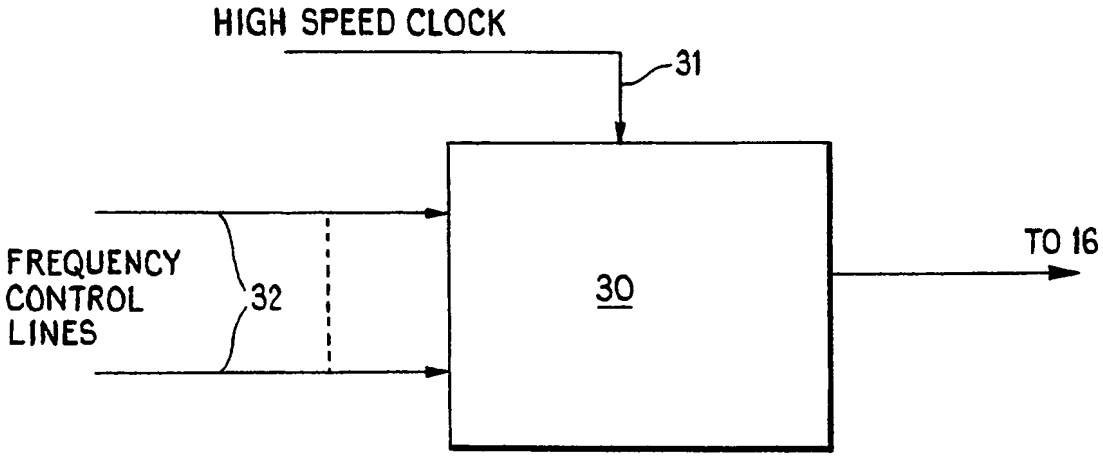

FIG. 3

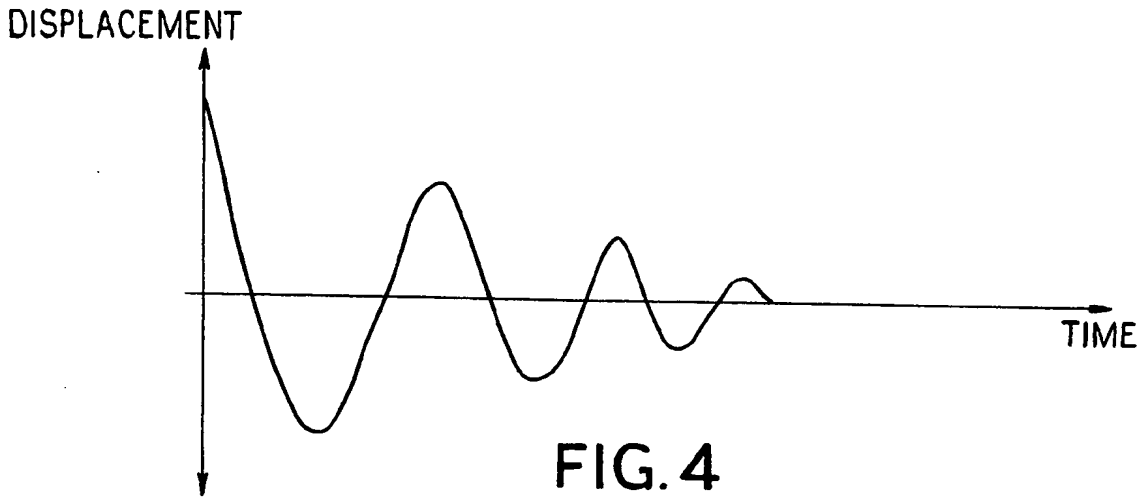

FIG. 4

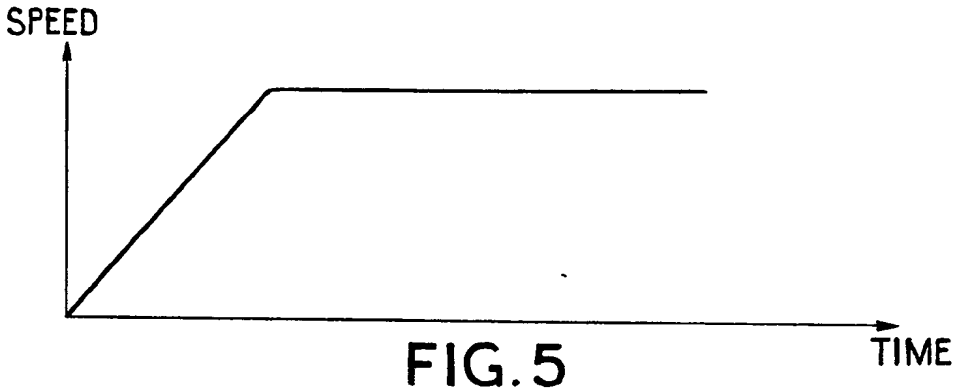

FIG. 5

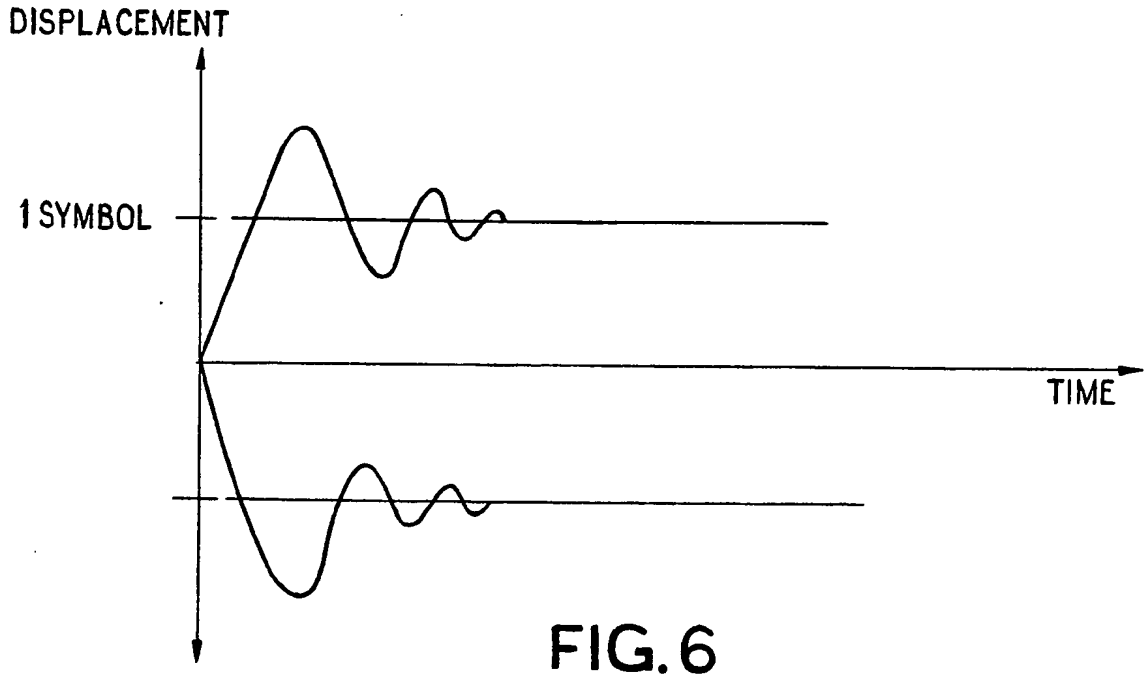

FIG. 6